REMARKS

The Office Action of November 8, 2000 and the references cited therein have now been carefully studied. Reconsideration and allowance of this application are earnestly solicited.

Initially, it is acknowledged that the above-noted Office Action is directed to Group III (Figures 5A-5C) having claims 25-27 readable thereon. However, it is noted that claims 36, 40 and 41 are dependent from claims 25 or 26 and should be examined herewith.

The Examiner objected to the specification for various informalities. It is noted that the applicant is enclosing herewith marked-up copies of these changes, as well as clean copies to be substituted for the marked-up copies.

The Examiner has rejected claims 25-27 as being obvious in view of the patent to Peng (claim 25), as well as being unpatentable over Peng in view of Joseph et al (claim 26), as well as being unpatentable over Peng in view of England (claim 27). This rejection is respectfully traversed.

The present invention is directed to a focusing device used to quickly focus 2D coded symbologies. A multiple line charge couple device (CCD) detector 93 is included along with a focusing disc 94 provided with a series of different thickness optical positions 132. The thickness of the optical positions is varied to focus an objective lens 92 onto the CCD detector 93 during image capture. As the focusing disc 94 is rotated, illuminating light is reflected back through an objective lens 92 through each of the optical positions 132 and onto the CCD detector 93. Only a fraction of the pixels of the CCD detector would be employed to optimize this focusing process. The CCD detector 93 generates image data as 494 lines, one line at a time. However, to accelerate the focusing process, the first 246 lines are dumped instead of being digitized and the next ten lines are the only lines utilized in the analysis to determine the optimal focus. The remaining lines (lines 257-494) are never read. In this manner, the focusing time is more than halved.

The Examiner has rejected claim 25 over the patent to Peng since, in the opinion of the Examiner, Peng teaches all of the elements in claim 25 with the exception of utilizing a CCD having a resolution of 659 by 494, shifting out the data substantially serially, and the largest representative value corresponding to one of the optical positions producing optimal focus. However, the Examiner has also taken the position that all of these features are obvious to once skilled in the art. This rejection is respectfully traversed.

It is important to note that the present invention utilizes a CCD having multiple lines. This is in contradistinction to the Peng (along with the Joseph et al and England references) which include a CCD having a single scan. Therefore, none of these references teach the use of a multiple line CCD in which a microprocessor evaluates a central set of multiple lines to produce a representative value for each of the multiple optical positions. One of the main purposes of the present invention is to greatly accelerate the focusing time of the imager. In this regard, the present invention only utilizes ten out of 494 lines in this process. Since Peng employs only a single line CCD, it would be impossible to decrease the focusing time of Peng in the manner recited in the present invention. It is also noted that the patent to Peng is directed to a reflective focusing apparatus in contradistinction to the present invention which employs an optically transmissive focusing apparatus. It is noted that several of the claims now present in this application recite the use of a light transmissive focusing apparatus. For the above-noted reasons, it is believed that claim 25 is not anticipated or suggested by the Peng reference.

The Examiner has rejected claim 26 under 35 USC 103 as being unpatentable over Peng in view of Joseph et al. This rejection is respectfully traversed.

The Examiner has indicated that Joseph et al teaches disposing the first set of multiple scan lines of a CCD and then sampling a second set of scan lines from the central set. It is noted that the patent to Joseph et al is directed to a 1D CCD bar

code reader. While column 6, line 37 - column 7, line 27 discuss a method of increasing the speed of the 1D CCD device, this reference is not directed at an apparatus for increasing the focusing speed of the 1D CCD device. Therefore, one would not look to the Joseph et al patent to alter the Peng patent with respect to a device for changing the focusing speed. The various arrangements bridging columns 6 and 7 speed up the operation of the CCD device, are, for example, providing an adjustable field stop 70 to assure that various pixels never receive any incoming light. Alternatively, the field stop 70 could be dispensed with by pre-aligning a plurality of 1D CCD arrays that have been optically blank by differing amounts. Finally, several CCD devices, such as shift registers 100, 102 and 104 can be aligned on one CCD chip. None of these alternatives, as indicated hereinabove, are directed to a means of increasing the focusing speed of an imager. Additionally, certainly, the patent to Joseph et al does not employ a device in which only a central set of multiple lines are used to produce a representative value used to determine the optimal optical position of a focusing disc. Consequently, reconsideration and allowance of claim 26 is earnestly solicited.

The Examiner has rejected claim 27 under 35 USC 103 as being unpatentable over Peng in view of the patent to England. This rejection is respectfully traversed.

Claim 27 recites an optical symbology imager wherein the representative value is produced by totally and first seven to ten values from multiple values. This rejection is respectively traversed.

As was true with respect to the patent to Joseph et al, the patent to England is not directed to a method and apparatus for increasing the focusing time of a symbology imager. Therefore, since claim 27 is dependent from claim 25, the reasons for the inapplicability of the Peng reference, as well as the reference to England are maintained. Therefore, reconsideration and allowance of this claim is earnestly solicited.

Applicant has added additional claims to more specifically recite the teachings of the present invention. It is believed that these additional claims are not anticipated or rendered obvious by any of the references cited by the Examiner, as well as claims 36, 41 and 41. Therefore, reconsideration and allowance is this application are earnest solicited.

Respectfully submitted,

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OPTICAL SYMBOLOGIES IMAGER

CROSS REFERENCE TO RELATED APPLICATIONS

This application is related to copending U.S. Patent Application Serial No. 09/151,766 (Symbology Imager System and Reading Apparatus and Method) and United States Application No. 09/151,765 (Diffused Surface Illumination Apparatus and Method) the entire disclosures of which are incorporated herein by reference. Further, International Application Serial No. WO 97/42756 filed on May 6, 1996, for a Smart Progressive-Scan Charge Coupled Device Camera, and which was filed by CIMatrix, one of the co-applicant's of the present application is also incorporated herein by reference.

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to an imager for reading optical symbologies such as traditional bar codes and 2D symbologies. More particularly, the present invention relates to a hand-held optical code imager which quickly and easily adjusts illumination and focus and has an preferred operating range of approximately 1.5 to 16 inches, however, the imager may have an operating range with both lower and higher limits, and still fall within the intended scope of the present application.

2. Description of the Prior Art

The use of bar codes has proliferated to the point where they are used in almost every industry to provide machine readable information about an item or product and to help track such items. Numerous different symbologies have been developed, such as one dimensional linear codes and 2D codes, such as Data Matrix. Typical linear codes comprise a series of parallel lines of varying thickness and spacing which are arranged in a linear configuration to represent a digital code containing information relating to the object. The use of bar codes has expanded due to the fact that the imaging and tracking process eliminates human error and can be performed quickly.

Two-dimensional arrays such as charge coupled device (CCD) arrays have been used to create the image of the bar code as it is scanned, but traditionally a laser and a single photodiode are used for scanning a linear bar code. A CCD having dimensions of 640 by 480 pixels provides sufficient resolution for use with VGA monitors, and is widely accepted. The video image is sensed in the CCD, which generates an analog signal representing the variation in intensity of the image, and an analog to digital converter puts the image signal into digital form for subsequent decoding. Two dimensional sensors are used with spatially oriented 2D codes.

For a non-contact hand-held scanner, it is necessary to be able to read the bar code over a reasonable distance, to provide sufficient illumination, to focus the scanner onto the bar code and perform the entire operation in a reasonable amount of time. While it may be possible to create an imager which can perform all of the desired functions, if the imager does not operate in a manner the user finds comfortable and sufficient, then the imager will not be accepted by end users and will not be commercially viable. For example, if the imager cannot perform the focusing quickly enough, then variations in the position of the scanner, due to the inability of the user to hold the imager steady, will create problems which cannot be easily overcome.

By way of example, if a scanner takes too long to perform a focusing function from the moment the user depresses a trigger, then the position of the scanner relative to the bar code may vary during the focusing operation thereby requiring yet another focusing operation. Similarly, such movement in the position of the scanner relative to the bar code will change the parameters for achieving the desired illumination.

etched directed onto the product. The information is typically encoded in feature sizes of 5, 7.5, or 10 mils. As a result, the imager 10 needs to be much closer when reading 2D symbologies 54 than for linear codes 40.

The imager 10 is shown in cross-section in Fig. 4, where the optical system 80 is illustrated as including objective taking lens 92 and focusing disk 94. The disk is driven rotational at 600 RPM about axis 91 by the motor 96. The rotational axis 91 is offset from the optical axis O_A of the imaging system 80. A dark field illuminator 82 having multiple light emitting elements 98, such as LEDs, which illuminate rearwardly onto a non-transparent wall, which then provides diffuse light to the window 22. A bright field illuminator 84 is provided with multiple light emitting elements 100 for radiating forward directly through the window 22. Dark field illumination is provided for direct product marking (low contrast), while bright field illumination is used primarily for high contrast label marks.

Built-in bright field and dark field illumination are provided to achieve proper contrast for reading the symbologies on direct product marked parts at close-in distances. Only bright field illumination is used at greater working distances. The details of the illumination system are set forth in co-pending commonly owned patent application serial no. 09/151,765 filed on September 11, 1998.

A key aspect of the present invention is the CCD detector 93, positioned along the optical axis O_A. The CCD detector 93 is rectangular and has a VGA pixel density. In the preferred embodiment, the CCD detector 93 is an interline 659 x 494 progressive scan, monochromatic CCD, which may be manufactured by Panasonic Corporation, model #MN37761AE, or a 659 x 494 pixel CCD manufactured by Sony Corporation, model # ICX084AL.

Both of the foregoing CCD's provide 640 x 480 resolution commonly used in VGA monitors. While the preferred embodiment illustrated herein utilizes a CCD, other array detectors such as CMOS, or other sensors may be used. Furthermore, the CCD need not be limited to 640 by 480 and may have other sizes.

The hand-held imager 10 can decode multiple symbologies on any background, including etched metal and printed ink jet. The paramount reading capability for use on surfaces that are direct product marked is the Data Matrix symbology.

A first embodiment of the focusing disk 94, shown in cross-section in Fig. 4, is shown in greater detail in Fig. 5a. The disk 94 has a series of different thickness optical positions 132. The thickness of the optical positions 132 is varied to focus the objective lens 92 onto the CCD detector 93 during image capture. The illustrated embodiment shows twelve optical positions 132 which thereby provide twelve potential focus ranges. A positional encoding strip 134 is provided on the disk 94 so that the position of the disk can be tracked. However, it is noted that the invention could operate with at least two optical positions.

Referring to Figs. 5b and 5c, planar and cross-sectional views of a second embodiment of the focusing disk 94 is shown. The second embodiment has eight optical positions 132 and further includes an outer circumferential wall 136 which provides additional structural support.

The CCD detector 93 is utilized to determine which optical plate 132, and therefore which focusing zone, is appropriate for a particular coded symbology scan. As the disk 94 is rotated, the illuminating light is reflected back through the objective lens 92 through each of the optical positions 132 and onto the CCD detector 93. In order to minimize the time it takes to focus the imager 10, only a fraction of the pixels of

WHAT IS CLAIMED IS:

1. An optical symbology imager, comprising:

a two dimensional photodetector having an active area for capturing an image of said optical symbology;

a focusing means for providing at least two focusing zones of said optical symbology; and

a control means for controlling said focusing means and said two dimensional photodetector to determine an optimum focus state,

wherein said focusing means is controlled by said control means to provide image data to said two dimensional photodetector for each of said at least two focusing zones,

said active area of said two dimensional photodetector shifting out said image data serially, and storing a central portion of said image data in a memory in said control means,

said control means evaluating transitions between light and dark data in said central portion of said image data to produce a representative value for each of said at least two focusing zones, wherein a largest representative value indicates which of said focusing zones provides the best focus.

2. An optical symbology imager as recited in claim 1, wherein said two dimensional photodetector is a CCD.

3. An optical symbology imager as recited in claim 2, wherein said CCD disposes of a first set of multiple scan lines, and then samples said central portion.

4. An optical symbology imager as recited in claim 3, wherein said CCD has a resolution of 659 by 494 in said active area.

5. An optical symbology imager as recited in claim 1, wherein said representative value is produced by totaling a high

frequency subset of values produced from a complete set of frequency values for each of said multiple focusing zones.

6. An optical symbology imager as recited in claim 3, wherein said representative value is produced by totaling a high frequency subset of values produced from a complete set of frequency values for each of said multiple focusing zones.

7. An optical symbology imager as recited in claim 1, wherein said control means is a microprocessor.

8. An optical symbology imager as recited in claim 1, wherein said focusing means provides twelve focusing zones.

9. An optical symbology imager as recited in claim 8, wherein said focusing means comprises a focusing disk having twelve optical positions, said focusing disk being rotatable so that each of said twelve optical positions can be moved into an optical axis of said imager, said two dimensional photodetector performing image capture for each of said twelve optical positions.

10. An optical symbology imager as recited in claim 1, further comprising an illumination means for providing variable illumination of said optical symbology.

11. An optical symbology imager as recited in claim 10, wherein said two dimensional photodetector receives said image data for multiple illumination conditions, as provided by said illumination means, said control means calculates edge totals for each image and optimum illumination is determined for one of said multiple illumination states having a largest edge total.

12. An optical symbology imager, comprising

a two dimensional photodetector having an active area for capturing an image of said optical symbology;

an illumination means for providing variable illumination of said optical symbology; and

control means for controlling said illuminating means and said two dimensional photodetector to determine optimum illumination, said illumination means providing multiple illumination conditions, said two dimensional sensor receiving image data for each of said multiple illumination conditions, said control means calculating edge totals for each image data received by said two dimensional photodetector comparing said edge totals and utilizing a largest of said edge totals as an indicator of said optimum illumination.

13. An optical symbology imager as recited in claim 12 wherein said two dimensional photodetector is a CCD.

14. An optical symbology imager as recited in claim 13, wherein said CCD disposes of a first set of multiple scan lines, and then samples said central portion.

15. An optical symbology imager as recited in claim 14, wherein said CCD has a resolution of 659 by 494 in said active area.

16. An optical symbology imager as recited in claim 12, wherein said control means is a microprocessor.

17. An optical symbology imager as recited in claim 10, wherein said illumination means comprises a dark field illuminator and a bright field illuminator.

18. An optical symbology imager as recited in claim 17, wherein said dark field illuminator comprises multiple light emitting diodes facing away from said optical symbology.

19. An optical symbology imager as recited in claim 17, wherein said bright field illuminator comprises multiple light emitting elements facing said optical symbology.

20. An optical symbology imager as recited in claim 18, wherein said bright field illuminator comprises multiple light emitting elements facing said optical symbology.

21. An optical symbology imager as recited in claim 12, wherein said illumination means comprises a dark field illuminator and a bright field illuminator.

22. An optical symbology imager as recited in claim 21, wherein said dark field illuminator comprises multiple light emitting diodes facing away from said optical symbology.

23. An optical symbology imager as recited in claim 21, wherein said bright field illuminator comprises multiple light emitting elements facing said optical symbology.

24. An optical symbology imager as recited in claim 23, wherein said bright field illuminator comprises multiple light emitting elements facing said optical symbology.

Amended

25. An optical symbology imager, comprising:

a multiple line charge coupled device (CCD) having an active area ~~with a resolution of 659 by 494~~;

a focusing apparatus comprising a focusing disk with multiple optical positions to provide different focal lengths, said disk being rotatable so that each of said multiple optical positions can move into an optical path of said imager,

a microprocessor for controlling said focusing apparatus and operation of said CCD, so that said CCD performs image capture producing image data for each of said multiple optical positions,

said microprocessor controlling said CCD to shift out said image data substantially serially, and

said microprocessor evaluating transitions between light and dark data in a central set of multiple ~~scan~~ lines to produce a representative value for each of said multiple optical positions, wherein a largest representative value corresponds to one of said optical positions producing optimum focus.

Amended

26. An optical symbology imager as recited in claim 25, wherein said CCD disposes of a first set of multiple ~~scan~~ lines, and then samples a second subsequent set of ~~scan~~ lines from said central set of scan lines.

27. An optical symbology imager as recited in claim 25, wherein said representative value is produced by totaling a first seven to ten values from multiple values produced for each of said multiple focusing zones.

28. A method of reading an optical symbology comprising the steps of:

capturing an image of said optical symbology in an active area of a two dimensional photodetector;

providing at least two focusing zones of said optical symbology,

controlling said two dimensional photodetector to receive said image of said optical symbology for each said two focusing zones in said active area;

said active area of said two dimensional photodetector shifting out said image data substantially serially, and

evaluating transitions between light and dark data in a central set of scan lines, producing a representative value for each of said at least two focusing zones, and determine optimum focus based upon a largest of said representative values.

29. A method of reading an optical symbology as recited in claim 28, wherein said central set of lines is ten lines.

30. A method of reading an optical symbology as recited in claim 28, further comprising the step of producing said representative value by adding a first seven to ten values from a complete set of frequency values for each of said multiple focusing zones.

31. A method of reading an optical symbology as recited in claim 28, wherein said multiple focusing zones are twelve zones.

32. A method of reading an optical symbology as recited in claim 28, wherein said focusing step comprises the step of changing between said multiple focusing zones.

33. A method of reading an optical symbology comprising the steps of:

providing multiple illumination conditions of said optical symbology;

capturing an image of said optical symbology in an active area of a two dimensional photodetector for each of said multiple illumination conditions,

determining optimum illumination by calculating edge totals for each image data received by said two dimensional photodetector;

comparing said edge total for all of said multiple illumination conditions to determine a largest edge total, and

utilizing said largest edge total as an indicator of optimum illumination.

34. An optical symbology imager as recited in claim 1, wherein said optical symbology imager is hand-held.

35. An optical symbology imager as recited in claim 12, wherein said optical symbology imager is hand-held.

36. An optical symbology imager as recited in claim 25, wherein said optical symbology imager is hand-held.

37. An optical symbology imager as recited in claim 8, wherein said focusing means comprises a focusing disk having multiple optical positions, said focusing disk being rotatable so that each of said multiple optical positions can be moved into an optical axis of said imager, said two dimensional photodetector performing image capture for each of said multiple optical positions.

Amended

38. An optical symbology imager as recited in claim 15, wherein said first set of multiple ~~scan~~ lines is 246 lines.

39. An optical symbology imager as recited in claim 15, wherein said second set of scan lines is substantially ten lines.

Amended

40. An optical symbology imager as recited in claim 26, wherein said first set of multiple ~~scan~~ lines is 246 lines.

Amended

41. An optical symbology imager as recited in claim 26, wherein said second set of multiple ~~scan~~ lines is substantially ten lines.

WHAT IS CLAIMED IS:

1. An optical symbology imager, comprising:

a two dimensional photodetector having an active area for capturing an image of said optical symbology;

a focusing means for providing at least two focusing zones of said optical symbology; and

a control means for controlling said focusing means and said two dimensional photodetector to determine an optimum focus state,

wherein said focusing means is controlled by said control means to provide image data to said two dimensional photodetector for each of said at least two focusing zones,

said active area of said two dimensional photodetector shifting out said image data serially, and storing a central portion of said image data in a memory in said control means,

said control means evaluating transitions between light and dark data in said central portion of said image data to produce a representative value for each of said at least two focusing zones, wherein a largest representative value indicates which of said focusing zones provides the best focus.

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2. An optical symbology imager as recited in claim 1, wherein said two dimensional photodetector is a CCD.

3. An optical symbology imager as recited in claim 2, wherein said CCD disposes of a first set of multiple scan lines, and then samples said central portion.

4. An optical symbology imager as recited in claim 3, wherein said CCD has a resolution of 659 by 494 in said active area.

5. An optical symbology imager as recited in claim 1, wherein said representative value is produced by totaling a high frequency subset of values produced from a complete set of frequency values for each of said multiple focusing zones.

6. An optical symbology imager as recited in claim 3, wherein said representative value is produced by totaling a high frequency subset of values produced from a complete set of frequency values for each of said multiple focusing zones.

7. An optical symbology imager as recited in claim 1, wherein said control means is a microprocessor.

8. An optical symbology imager as recited in claim 1, wherein said focusing means provides twelve focusing zones.

9. An optical symbology imager as recited in claim 8, wherein said focusing means comprises a focusing disk having twelve optical positions, said focusing disk being rotatable so that each of said twelve optical positions can be moved into an optical axis of said imager, said two dimensional photodetector performing image capture for each of said twelve optical positions.

10. An optical symbology imager as recited in claim 1, further comprising an illumination means for providing variable illumination of said optical symbology.

11. An optical symbology imager as recited in claim 10, wherein said two dimensional photodetector receives said image data for multiple illumination conditions, as provided by said illumination means, said control means calculates edge totals for each image and optimum illumination is determined for one of said multiple illumination states having a largest edge total.

12. An optical symbology imager, comprising

a two dimensional photodetector having an active area for capturing an image of said optical symbology;

an illumination means for providing variable illumination of said optical symbology; and

control means for controlling said illuminating means and said two dimensional photodetector to determine optimum illumination, said illumination means providing multiple illumination conditions, said two dimensional sensor receiving image data for each of said multiple illumination conditions, said control means calculating edge totals for each image data received by said two dimensional photodetector comparing said edge totals and utilizing a largest of said edge totals as an indicator of said optimum illumination.

13. An optical symbology imager as recited in claim 12 wherein said two dimensional photodetector is a CCD.

14. An optical symbology imager as recited in claim 13, wherein said CCD disposes of a first set of multiple scan lines, and then samples said central portion.

15. An optical symbology imager as recited in claim 14, wherein said CCD has a resolution of 659 by 494 in said active area.

16. An optical symbology imager as recited in claim 12, wherein said control means is a microprocessor.

17. An optical symbology imager as recited in claim 10, wherein said illumination means comprises a dark field illuminator and a bright field illuminator.

18. An optical symbology imager as recited in claim 17, wherein said dark field illuminator comprises multiple light emitting diodes facing away from said optical symbology.

19. An optical symbology imager as recited in claim 17, wherein said bright field illuminator comprises multiple light emitting elements facing said optical symbology.

20. An optical symbology imager as recited in claim 18, wherein said bright field illuminator comprises multiple light emitting elements facing said optical symbology.

21. An optical symbology imager as recited in claim 12, wherein said illumination means comprises a dark field illuminator and a bright field illuminator.

22. An optical symbology imager as recited in claim 21, wherein said dark field illuminator comprises multiple light emitting diodes facing away from said optical symbology.

23. An optical symbology imager as recited in claim 21, wherein said bright field illuminator comprises multiple light emitting elements facing said optical symbology.

24. An optical symbology imager as recited in claim 23, wherein said bright field illuminator comprises multiple light emitting elements facing said optical symbology.

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25. (Amended) An optical symbology imager, comprising:

a multiple line charge coupled device (CCD) having an active area;

a focusing apparatus comprising a focusing disk with multiple optical positions to provide different focal lengths, said disk being rotatable so that each of said multiple optical positions can move into an optical path of said imager,

a microprocessor for controlling said focusing apparatus and operation of said CCD, so that said CCD performs image capture producing image data for each of said multiple optical positions,

said microprocessor controlling said CCD to shift out said image data substantially serially, and

said microprocessor evaluating transitions between light and dark data in a central set of multiple lines to produce a representative value for each of said multiple optical positions, wherein a largest representative value corresponds to one of said optical positions producing optimum focus.

26. (Amended) An optical symbology imager as recited in claim 25, wherein said CCD disposes of a first set of multiple lines, and then samples a second subsequent set of lines from said central set of scan lines.

27. An optical symbology imager as recited in claim 25, wherein said representative value is produced by totaling a first seven to ten values from multiple values produced for each of said multiple focusing zones.

28. A method of reading an optical symbology comprising the steps of:

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capturing an image of said optical symbology in an active area of a two dimensional photodetector;

providing at least two focusing zones of said optical symbology,

controlling said two dimensional photodetector to receive said image of said optical symbology for each said two focusing zones in said active area;

said active area of said two dimensional photodetector shifting out said image data substantially serially, and

evaluating transitions between light and dark data in a central set of scan lines, producing a representative value for each of said at least two focusing zones, and determine optimum focus based upon a largest of said representative values.

29. A method of reading an optical symbology as recited in claim 28, wherein said central set of lines is ten lines.

30. A method of reading an optical symbology as recited in claim 28, further comprising the step of producing said representative value by adding a first seven to ten values from a complete set of frequency values for each of said multiple focusing zones.

31. A method of reading an optical symbology as recited in claim 28, wherein said multiple focusing zones are twelve zones.

32. A method of reading an optical symbology as recited in claim 28, wherein said focusing step comprises the step of changing between said multiple focusing zones.

33. A method of reading an optical symbology comprising the steps of:

providing multiple illumination conditions of said optical symbology;

capturing an image of said optical symbology in an active area of a two dimensional photodetector for each of said multiple illumination conditions,

determining optimum illumination by calculating edge totals for each image data received by said two dimensional photodetector;

comparing said edge total for all of said multiple illumination conditions to determine a largest edge total, and

utilizing said largest edge total as an indicator of optimum illumination.

34. An optical symbology imager as recited in claim 1, wherein said optical symbology imager is hand-held.

35. An optical symbology imager as recited in claim 12, wherein said optical symbology imager is hand-held.

36. An optical symbology imager as recited in claim 25, wherein said optical symbology imager is hand-held.

37. An optical symbology imager as recited in claim 8, wherein said focusing means comprises a focusing disk having multiple optical positions, said focusing disk being rotatable so that each of said multiple optical positions can be moved into an optical axis of said imager, said two dimensional photodetector performing image capture for each of said multiple optical positions.

38. (Amended) An optical symbology imager as recited in claim 15, wherein said first set of multiple lines is 246 lines.

39. An optical symbology imager as recited in claim 15, wherein said second set of scan lines is substantially ten lines.

~~40. (Amended) An optical symbology imager as recited in claim 26, wherein said first set of multiple lines is 246 lines.~~

~~41. (Amended) An optical symbology imager as recited in claim 26, wherein said second set of multiple lines is substantially ten lines.~~

42. (New) An optical symbology imager in accordance with claim 25 wherein said multiple line CCD has a resolution of 659 by 494.

43. (New) An optical symbology imager in accordance with claim 25, wherein said microprocessor only utilizes said central set of multiple lines to produce the optimum focus.

44. (New) An optical symbology imager comprising:

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a light transmissive focusing apparatus comprising a focusing disk with multiple optical positions to provide different focal lengths, said disk being rotatable so that each of said multiple optical positions can move into an optical path of said imager,

a microprocessor for controlling said focusing apparatus and operation of said CCD, so that said CCD performs image capture producing image data for each of said multiple optical positions,

said microprocessor controlling said CCD to shift out said image data substantially serially, and

said microprocessor evaluating transitions between light and dark data in a central set of multiple lines to produce a representative value for each of said multiple optical positions, wherein a largest representative value corresponds to one of said optical positions producing optimum focus.

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45. (New) An optical symbology imager in accordance with claim 44, wherein said representative value is produced by totaling a first seven to ten values from multiple values produced for each of said multiple focusing zones.

46. (New) An optical symbology imager in accordance with claim 44, wherein said representative value is produced by totaling a first seven to ten values from multiple values produced for each of said multiple focusing zones.

47. (New) An optical symbology imager in accordance with claim 44, wherein said multiple line CCD has a resolution of 659 by 494.

48. (New) An optical symbology imager in accordance with claim 44, wherein said microprocessor only utilizes said central set of multiple lines to produce the optimum focus.

Sub B5

49. (New) An optical symbology imager in accordance with claim 25, wherein said multiple optical position is at least two.

50. (New) An optical symbology imager in accordance with claim 25, wherein said multiple optical positions is eight.

51. (New) An optical symbology imager in accordance with claim 25, wherein said multiple optical position is twelve.

52. (New) An optical symbology imager in accordance with claim 44, wherein said multiple optical position is at least two.

53. (New) An optical symbology imager in accordance with claim 44, wherein said multiple optical positions is eight.

54. (New) An optical symbology imager in accordance with claim 44, wherein said multiple optical position is twelve.